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NANTICOKE

ENVIRONMENTAL COMMITTEE

1986 AIR QUALITY

DATA SUMMARY

DECEMBER 1987

Ontario
Ministry of the Environment

B.I. BOYKO, Director
West Central Region

NANTICOKE ENVIRONMENTAL COMMITTEE

1986 AIR QUALITY DATA SUMMARY

Ministry of the Environment
Air Quality Assessment
F. Dobroff
West Central Region

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

This report summarizes the results of air monitoring in the vicinity of the major industrial complex in the City of Nanticoke in 1986.

The data showed that air quality in the area was usually excellent as most pollutants measured were well below relevant objectives.

Localized problems were related to odours and fugitive dust emissions from Stelco in Nanticoke Village and fugitive dust emissions downwind of Ontario Hydro's Nanticoke Generating Station. The Generating Station was also the cause of short term sulphur dioxide fumigation episodes.

Stelco has taken measures to reduce fugitive dust emissions and is seeking approval for a measure to reduce odours. Ontario Hydro was served a Control Order to reduce dust emissions in 1985 and further measures were taken in 1986. More are planned for 1987.

The other major industry in the area, the Texaco Refinery, showed a mostly negligible impact on air quality.

RÉSUMÉ

Le présent rapport résume les résultats de l'analyse de l'air effectuée en 1986 dans les environs du grand complexe industriel de la ville de Nanticoke.

Les données révèlent que la qualité de l'air dans la région était dans l'ensemble excellente; la plupart des polluants mesurés étaient présents à des concentrations bien inférieures aux objectifs.

On a décelé des problèmes locaux relatifs à des odeurs et à des poussières libres provenant de l'usine Stelco du village de Nanticoke ainsi qu'à des poussières libres sous le vent de la centrale de Nanticoke d'Ontario Hydro. La centrale a également été la cause de brefs épisodes de rabattement du panache chargé de bioxyde de soufre.

Stelco a pris des mesures en vue de réduire ses émissions de poussières libres et a demandé l'autorisation d'appliquer une méthode visant à réduire les odeurs. En 1985, Ontario Hydro s'est vu signifier un arrêté d'intervention qui lui ordonnait de réduire ses émissions de poussières, et d'autres mesures ont été prises en 1986. D'autres sont prévues pour 1987.

L'autre grande entreprise de la région, la raffinerie Texaco, contribuait de manière plutôt négligeable à la pollution de l'air.

INTRODUCTION

The Nanticoke Environmental Management Program (NEMP) was formed in 1978 to co-ordinate a study into the impact of industrial development on air quality in the area surrounding Nanticoke. NEMP was sponsored jointly by the Federal and Ontario Governments, Ontario Hydro, Stelco and Texaco. Beginning in 1984, the West Central Region of the Ontario Ministry of the Environment assumed responsibility for network operations from Air Resources Branch. At that time, the monitoring network was reduced because air quality was generally good and intensive monitoring in outlying areas was not warranted.

In mid-1985, NEMP and a similar group concerned with water quality were amalgamated into one organization called the Nanticoke Environmental Committee. All activities are now undertaken under NEC and a private contractor funded by Texaco and Stelco provides one technician to assist in maintaining the network.

The purpose of the monitoring program is to determine compliance with provincial air quality criteria and also to measure the impact of the industrial development on the local air quality. Contaminants which may enter the area from outside sources are also identified.

The three main industries which have located in Nanticoke are Ontario Hydro's Thermal Generating Station, Texaco's oil refinery and Stelco's basic steel plant. A few smaller industries have located in the area as well.

NEC has undertaken to measure the ambient air concentrations of those compounds or substances that are regulated under the Provincial and Federal Environmental Protection Acts, and that could be a result of the Nanticoke industries' activities. The Ontario Ministry of the Environment's air quality criteria are set for the protection of human health and well being as well as to protect vegetation, animal life and property.

MONITORING NETWORK

Monitoring stations have been located to take into account predominant wind patterns and source location as well as to try to differentiate between industrial and other contributions.

A map of the 1986 network is shown in Figure 1, and the pollutants measured at each location are given in Table 1. Wind data (speed and direction) were measured at both Long Point and near Jarvis. Figure 2 displays the wind frequency distribution measured at Jarvis. Winds from the west and southwest tend to predominate. The Jarvis station's wind data were utilized in a computer program known as a "pollution rose" which is essentially a cross-tabulation of average hourly pollutant concentrations with wind direction. The pollution roses for individual stations are illustrated graphically on several maps in the report. For each "rose" presented, the length of individual lines drawn is proportional to the average concentration when the wind was blowing from that direction. The data from this program are a useful tool in identifying sources of pollutants.

In addition to the NEMP monitoring network, Ontario Hydro has operated its own network of sulphur dioxide analyzers since 1970. Some of these data are referred to in this report.

In 1986 modifications to the NEC network included:

- Moving SO_2 monitor 22091 (near Townsend) to station 22094 - Ontario Land Corporation office in the City of Townsend.

- Moving hydrocarbon analyzer from 22086 - Cheapside to 22907 - Nanticoke Village.

- Eliminating six fluoride candles in outlying areas while maintaining four candles around Stelco property.

- Eliminating six high volume samplers in outlying areas, while maintaining eight, mostly near the industries.

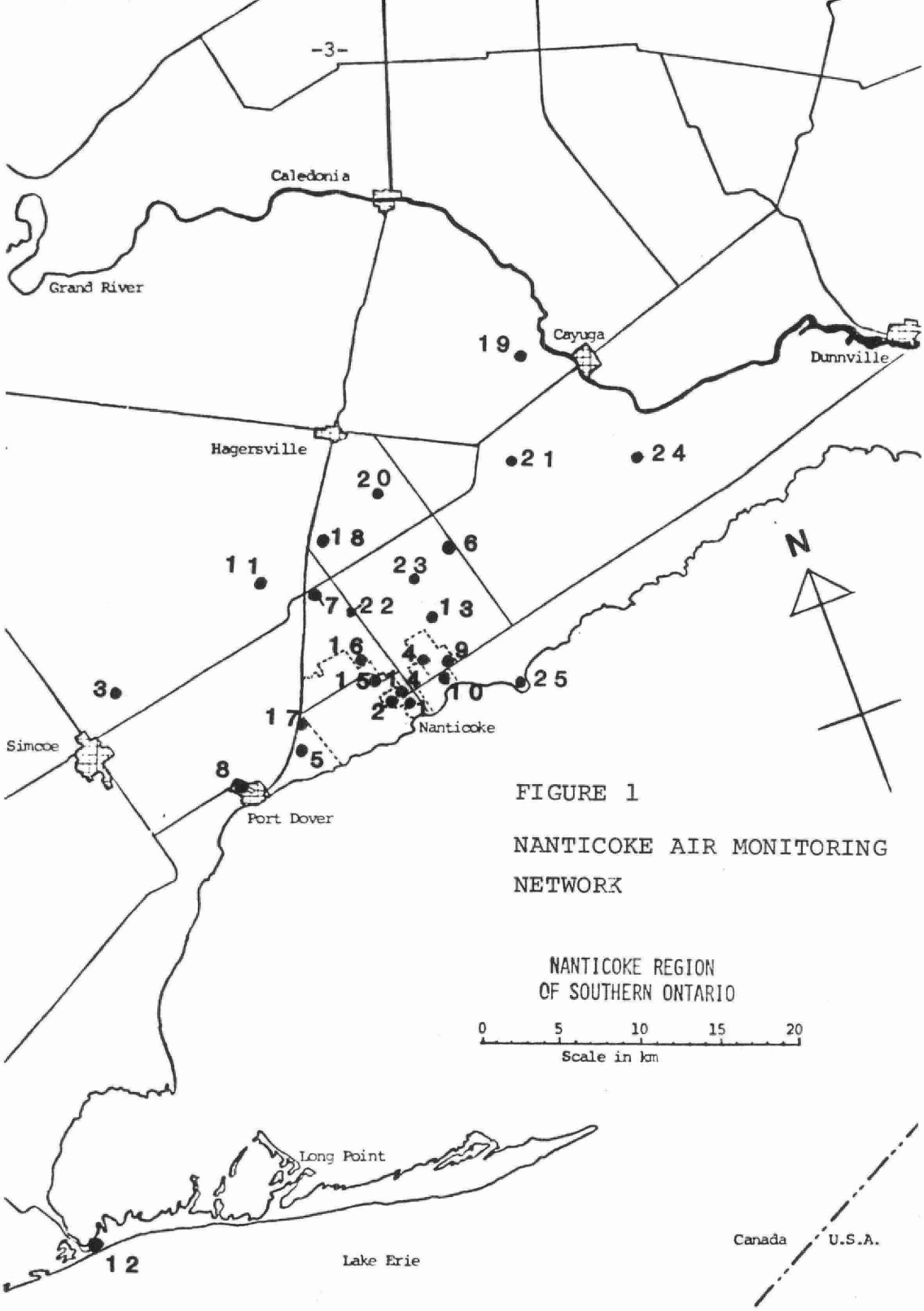


FIGURE 1

NANTICOKE AIR MONITORING NETWORK

NANTICOKE REGION
OF SOUTHERN ONTARIO

0 5 10 15 20
Scale in km

Canada U.S.A.

TABLE 1
MONITORING NETWORK

Map Ref.	Number	Location	SO_2	TSP	CHx	TRS	O_3	NOx	DF	F	Wind/Temp
1	22057	Nanticoke Creek								X	
2	22070	Nanticoke Village							X		
3	22071	Simcoe	X		X		X	X			
4	22074	Texaco								X	
5	22083	Dogs Nest								X	
6	22086	Cheapside	X			X		X			
7	22087	Jarvis		X							
8	22090	Port Dover		X							
9	22092	Rainham/Sandusk		X					X		
10	22093	N.G.S. Flyash Area							X		
11	22094	Townsend	X								
12	22901	Long Point	X				X	X			X

SO_2 - sulphur dioxide
TSP - total suspended particulate
CHx - hydrocarbons
TRS - total reduced sulphur
O_3 - ozone
NOx - oxides of nitrogen
DF - dustfall
F - fluoride

TABLE 1 (continued)
MONITORING NETWORK

Map Ref.	No.	Location	SO_2	TSP	CHx	TRS	O_3	NOx	DF	F	Wind/Temp
13	22904	S. Walpole School	X(O.H.)	X	X	X					
14	22907	Nanticoke Village	X	X	X	X					
15	22961	Nanticoke North		X						X	
16	22964	Stelco North		X							
17	22965	Dogs Nest/Hwy. 6		X							
18	22883	Jarvis Met Tower (Ontario Hydro)									X
19	22908	Decewsville(O.H.)	X								
20	22910	Garnet(O.H.)	X								
21	22911	Balmoral(O.H.)	X								
22	22913	Nanticoke Rd.(O.H.)	X								
23	22914	Sandusk(O.H.)	X								
24	22915	Kohler(O.H.)	X								
25	22919	Peacock Pt.(O.H.)	X								

SO_2 - sulphur dioxide
TSP - total suspended particulate
CHx - hydrocarbons
TRS - total reduced sulphur
O_3 - ozone
NOx - oxides of nitrogen
DF - dustfall
F - fluoride

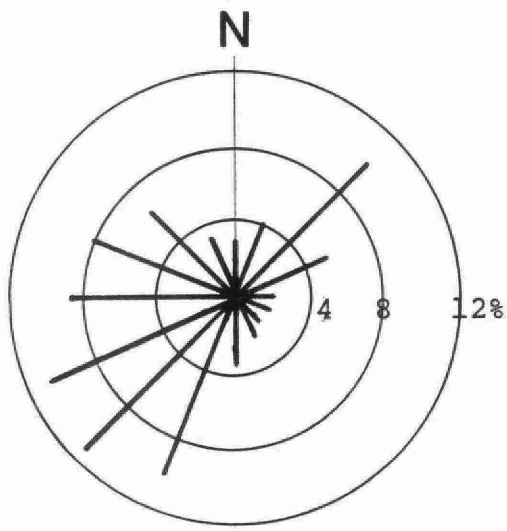
FIGURE 2

WIND FREQUENCY DISTRIBUTION

10 METRE LEVEL

JARVIS

ONTARIO HYDRO MET. TOWER



Lines indicate direction wind blew from

ANALYSIS OF DATA

Sulphur Dioxide

Sulphur dioxide (SO_2) was measured continuously at five sites within the NEC network and at eight Ontario Hydro stations in 1986. All of the stations easily met the annual and daily air quality objectives of .02 and .10 ppm respectively. Data from the Ministry monitors are given in Table 2a and data for the Hydro monitors is in Table 2b. Out of a total of over 100,000 hours of monitoring, the 1-hour objective of .25 ppm was exceeded twice during consecutive hours at 22086-Cheapside, once at 22094-Townsend and twice at Ontario Hydro monitor NNW08 on Nanticoke Road. Each exceedence was caused by short term fumigations resulting from the Generating Station's plume. Several other similar fumigation incidents were observed at other stations, but these did not exceed the hourly objective.

Pollution roses for SO_2 in Figure 3 for the five Ministry monitors generally showed a minor long-term impact from the Nanticoke industries (with the exception of Long Point) as highest averages were generally related to winds from the industrial area. These averages, however, were quite low. The Long Point station showed very low levels with no direction dominating.

Figure 4 illustrates the historical trend of sulphur dioxide annual average concentrations of eight SO_2 monitors which have operated continuously since 1976. Concentrations can be seen to be very uniform over this period with no deterioration in concentrations. Similarly in Figure 5, the number of hourly exceedences per year at these eight stations is shown. Only random fluctuation is apparent although a slight decline in the curve is apparent.

Total Reduced Sulphur

Total Reduced Sulphur (TRS) was monitored at three locations - Nanticoke Village, South Walpole School on Sandusk Rd. and on Cheapside Rd. just south of Highway 3. There are no general

TABLE 2a
SULPHUR DIOXIDE
UNITS - PARTS PER MILLION
MINISTRY OF ENVIRONMENT MONITORS

Ontario Objectives: 1-hour - .25
24-hour - .10
1-year - .02

			Annual Average	Maximum 1-hour	Maximum 24-hour	No. of Times Above Objective 1-hour	No. of Times Above Objective 24-hour
22071	Simcoe	1986	.003	.12	.02	0	0
		1985	.005	.10	.03	0	0
		1984	.004	.20	.04	0	0
22086	Cheapside	1986	.002	.33	.03	2	0
		1985	.003	.19	.03	0	0
		1984	.004	.07	.03	0	0
22094	Townsend	1986	.004	.26	.06	1	0
		1985	.004	.19	.04	0	0
		1984	.003	.35	.05	2	0
22901	Long Point	1986	.002	.07	.03	0	0
		1985	.002	.12	.02	0	0
		1984	.002	.15	.04	0	0
22907	Nanticoke Village	1986	.002	.16	.03	0	0
		1985	.002	.11	.02	0	0
		1984	.005	.22	.08	0	0

TABLE 2b
SULPHUR DIOXIDE
UNITS - PARTS PER MILLION
ONTARIO HYDRO MONITORS

Ontario Objectives: 1-hour - .25
24-hour - .10
1-year - .02

		Annual Average	Maximum 1-hour	No. of Times Above Objective 1-hour	24-hour
22908 Decewsville (NNE20)	1986	.005	.15	0	0
	1985	.004	.27	1	0
	1984	.006	.40	1	0
22910 Garnet (N15)	1986	.004	.10	0	0
	1985	.004	.14	0	0
	1984	.005	.18	0	0
22911 Balmoral (NNE16)	1986	.006	.20	0	0
	1985	.005	.26	1	0
	1984	.006	.26	1	0
22913 Nanticoke Rd. (NNW08)	1986	.004	.39	2	0
	1985	.004	.23	0	0
	1984	.005	.28	3	0
22914 Sandusk (N07)	1986	.006	.15	0	0
	1985	.006	.17	0	0
	1984	.007	.40	1	0
22915 Kohler (NE19)	1986	.004	.17	0	0
	1985	.004	.14	0	0
	1984	.005	.28	1	0
22916 Walpole South School (NNE05)	1986	.006	.24	0	0
	1985	.006	.23	0	0
	1984	.008	.19	0	0
22919 Peacock Pt. (E05)	1986	.004	.13	0	0
	1985	.005	.19	0	0
	1984	.006	.18	0	0

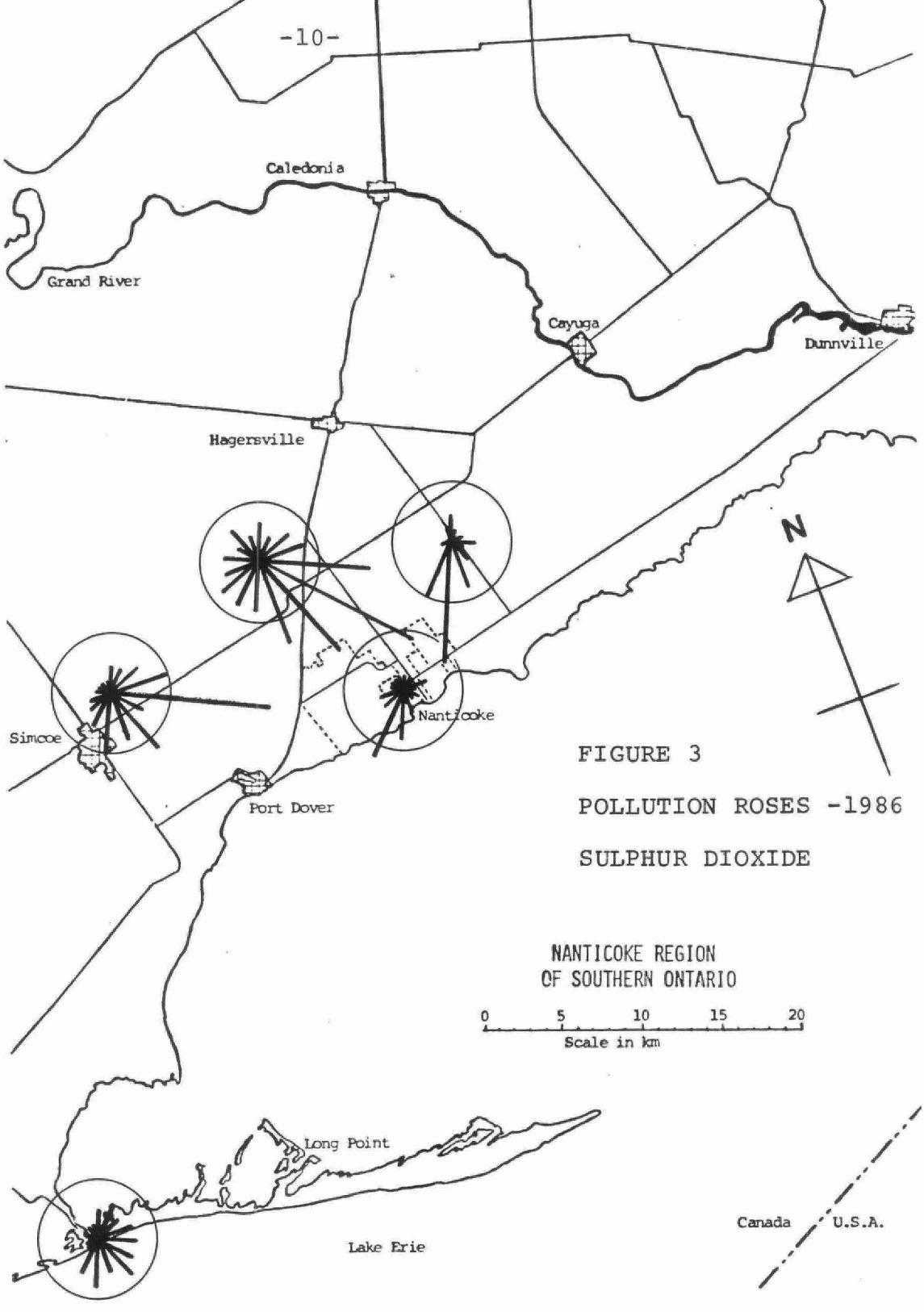


FIGURE 3

POLLUTION ROSES -1986

SULPHUR DIOXIDE

FIGURE 4

SULPHUR DIOXIDE YEARLY TREND

NANTICOKE 1976 – 1986

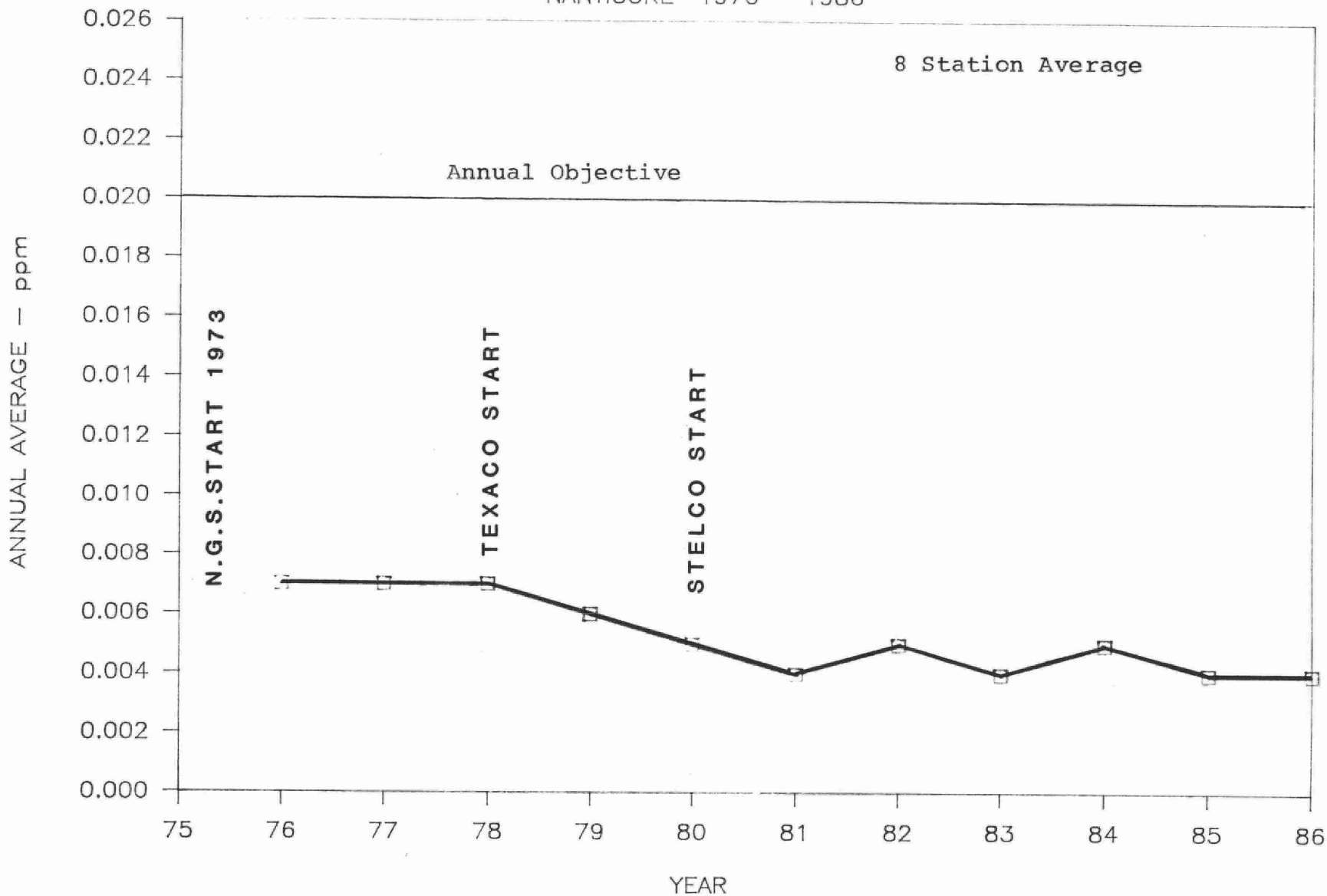
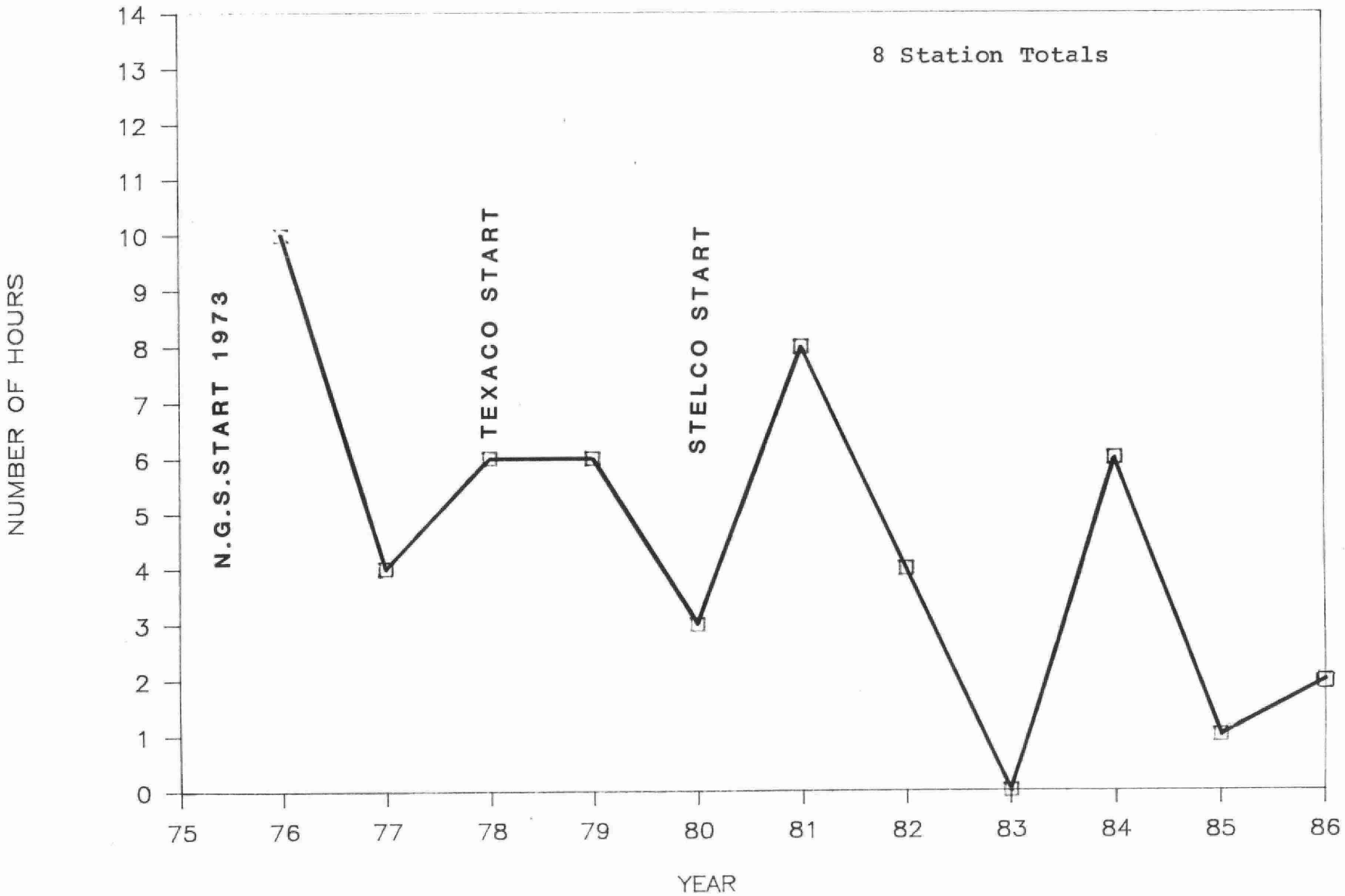


FIGURE 5

SO2 EXCEEDENCE TREND – NANTICOKE



criteria for TRS but there is an hourly objective for hydrogen sulphide (H_2S), the "rotten egg" gas, of 20 ppb, which is based on its odour threshold. The monitor measures H_2S, and many other sulphur compounds.

Sources of these pollutants include slag quenching activities at Stelco and fuel oil storage tanks and a sulphur recovery operation at Texaco. Apart from industrial sources, sulphur compounds can be liberated from groundwaters that have been contaminated by natural seepages or from leaking natural gas wells, known to exist in the area. Stelco emissions have been shown to consist primarily of H_2S and thus, comparison of TRS data to the H_2S objective, particularly within Nanticoke Village when downwind of Stelco, is reasonable. Texaco emissions have been less well characterized but are not believed to consist primarily of H_2S. Other organic sulphur compounds are probably present in their emissions and consequently levels downwind of Texaco cannot be rightfully compared to the H_2S standard. The TRS data are summarized in Table 3.

In 1986, TRS levels remained very low at the school and Cheapside stations. Nanticoke Village was unchanged from 1985 and showed the highest levels. Yearly trends are illustrated for each station in Figure 6, the trend in the number of hours exceeding an arbitrary flag concentration of 8 ppb. This concentration is an approximate odour threshold for H_2S. The Cheapside and school stations recorded only 6 hours combined above this concentration in 1986. The hourly H_2S objective (20 ppb) was not exceeded at the two stations.

As mentioned, levels recorded in Nanticoke Village close to Stelco were much higher on average. There were 103 hours above the flag concentration of 8 ppb here and the hourly H_2S objective (20 ppb) was exceeded during 19 hours during the year.

The school and Cheapside sites recorded mostly low levels and showed little, if any industrial impact. Levels at the school were actually lower than Cheapside despite being closer to Texaco. The school levels were almost undetectable.

TABLE 3
TOTAL REDUCED SULPHUR
UNITS - PARTS PER BILLION

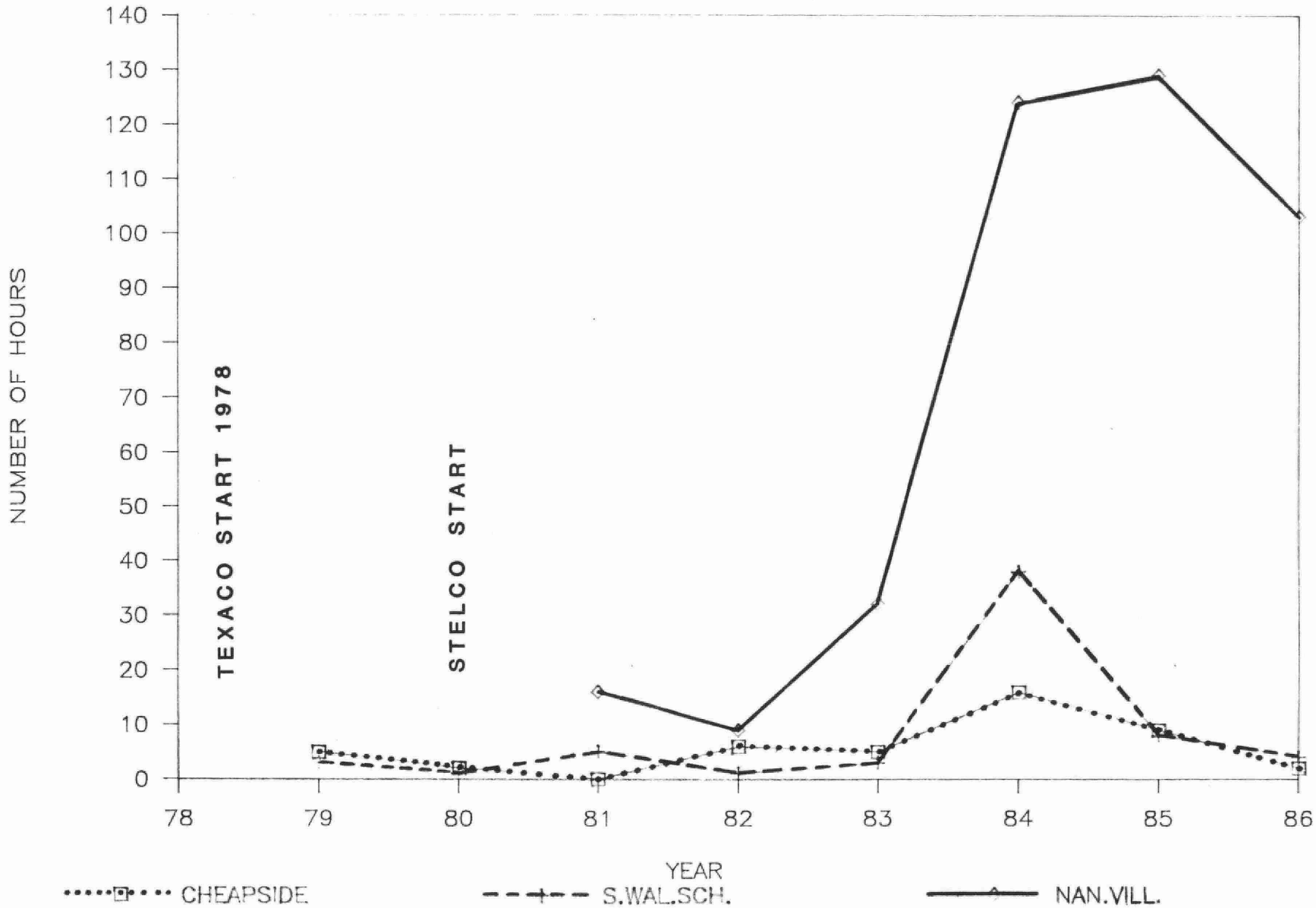
Ontario Objective: 1-hour -20
(Hydrogen Sulphide)

			Annual Average	Maximum 1-hour	No. of Hours Above Objective
22086	Cheapside	1986	.4	14	0
		1985	.3	51	2
		1984	.4	14	0
22904	South Walpole School	1986	.1	13	0
		1985	.2	20	0
		1984	.6	106	2
22907	Nanticoke Village	1986	.8	51	19
		1985	1.1	54	17
		1984	1.1	69	11

FIGURE 6

TOTAL REDUCED SULPHUR EXCEEDENCE TREND

HOURS OVER 8 PPB NANTICOKE



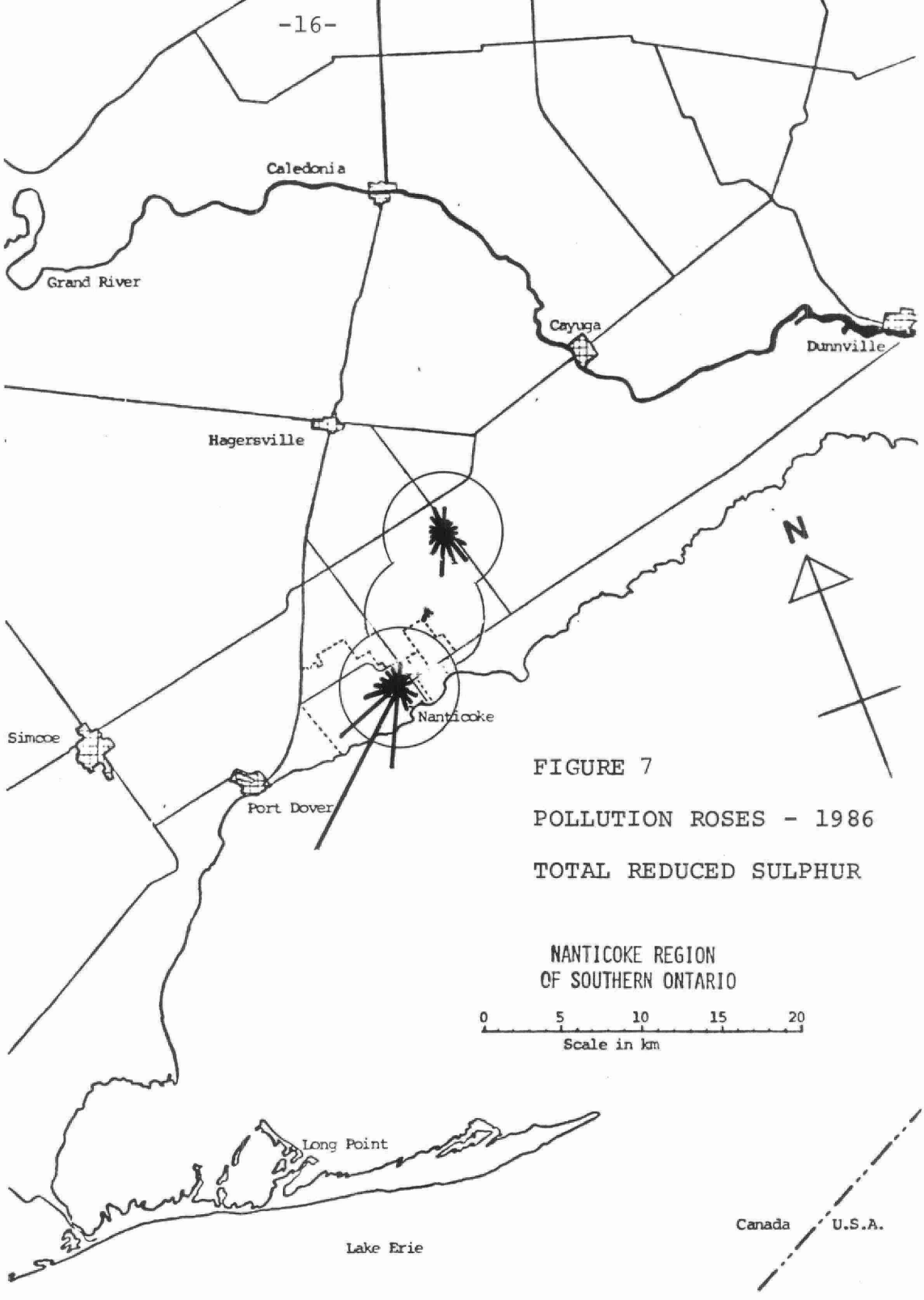


FIGURE 7

POLLUTION ROSES - 1986

TOTAL REDUCED SULPHUR

This is apparent in the pollution rose diagrams shown in Figure 7. Conversely, the rose for Nanticoke Village shows a much stronger impact on TRS from Stelco.

As shown in Figure 6, a deterioration in Nanticoke Village TRS levels is plainly evident in 1983-84 and levels have remained unchanged since then. The deterioration is likely due to increased slag quenching at Stelco. Discussions with Stelco have been undertaken in order to reduce TRS emissions and the company has applied for approval to lengthen their slag quenching pits. This would serve to increase the surface area of slag allowing for more air cooling, thus lessening quench emissions. Should this measure prove insufficient, other methods and practices will be investigated in order to reduce odours.

It should be noted that although the H_2S objective is only occasionally exceeded, valid odour problems can at times occur in Nanticoke Village. The difficulty in comparing odours to measured hourly averaged levels arises in the instantaneous detection of odorous sulphur compounds by the human nose. Odours can be of such a short term nature that an elevated hourly average does not occur.

Oxides of Nitrogen

Oxides of nitrogen result from high temperature combustion sources including the automobile. The most abundant oxides are nitric oxide (NO) which is largely a direct emission of fuel burning and nitrogen dioxide (NO_2) which is mostly an oxidation product once the contaminant is airborne. Objectives exist only for nitrogen dioxide and are based on odour threshold levels (hourly-.2 ppm) and health effects (24-hour - .1 ppm). Other adverse effects occurring at higher levels include vegetation damage, reduced visibility and corrosion of metals.

Data for NO_2 and NO for three stations are summarized in Tables 4 and 5. Levels in 1986 continued to be very low and well within objectives. There have never been any NO_2 exceedences measured.

TABLE 4
NITROGEN DIOXIDE
UNITS - PARTS PER MILLION

Objectives: 1-hour - .20
24-hour - .10

		Annual Average	Maximum 1-hour	Maximum 24-hour	No. of Times Above Objective 1-hour	No. of Times Above Objective 24 hour
22071 Simcoe	1986	.005	.09	.04	0	0
	1985	.006	.08	.03	0	0
	1984	.009	.13	.04	0	0
22086 Cheapside	1986	.005	.07	.03	0	0
	1985	.003	.05	.03	0	0
	1984	.004	.07	.03	0	0
22901 Long Point	1986	.007	.06	.03	0	0
	1985	.004	.06	.03	0	0
	1984	.003	.04	.03	0	0

TABLE 5
NITRIC OXIDE
UNITS - PARTS PER MILLION

		Annual Average	Maximum 1-hour	Maximum 24-hour
22071 Simcoe	1986	.007	.10	.03
	1985	.004	.12	.02
	1984	.005	.07	.03
22086 Cheapside	1986	.001	.13	.02
	1985	.001	.07	.02
	1984	.001	.12	.02
22901 Long Point	1986	.000	.04	.02
	1985	.001	.08	.01
	1984	.001	.13	.04

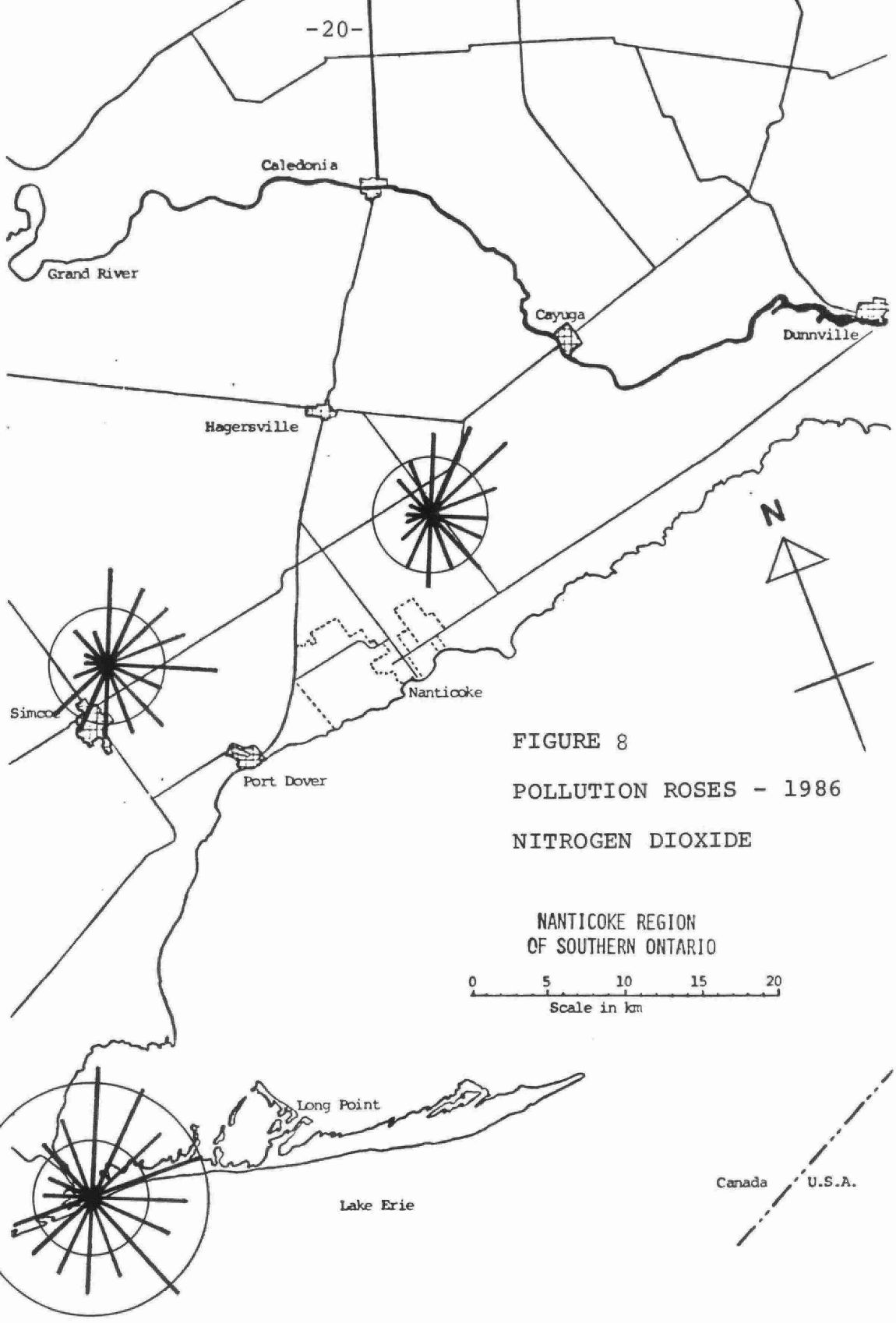


FIGURE 8

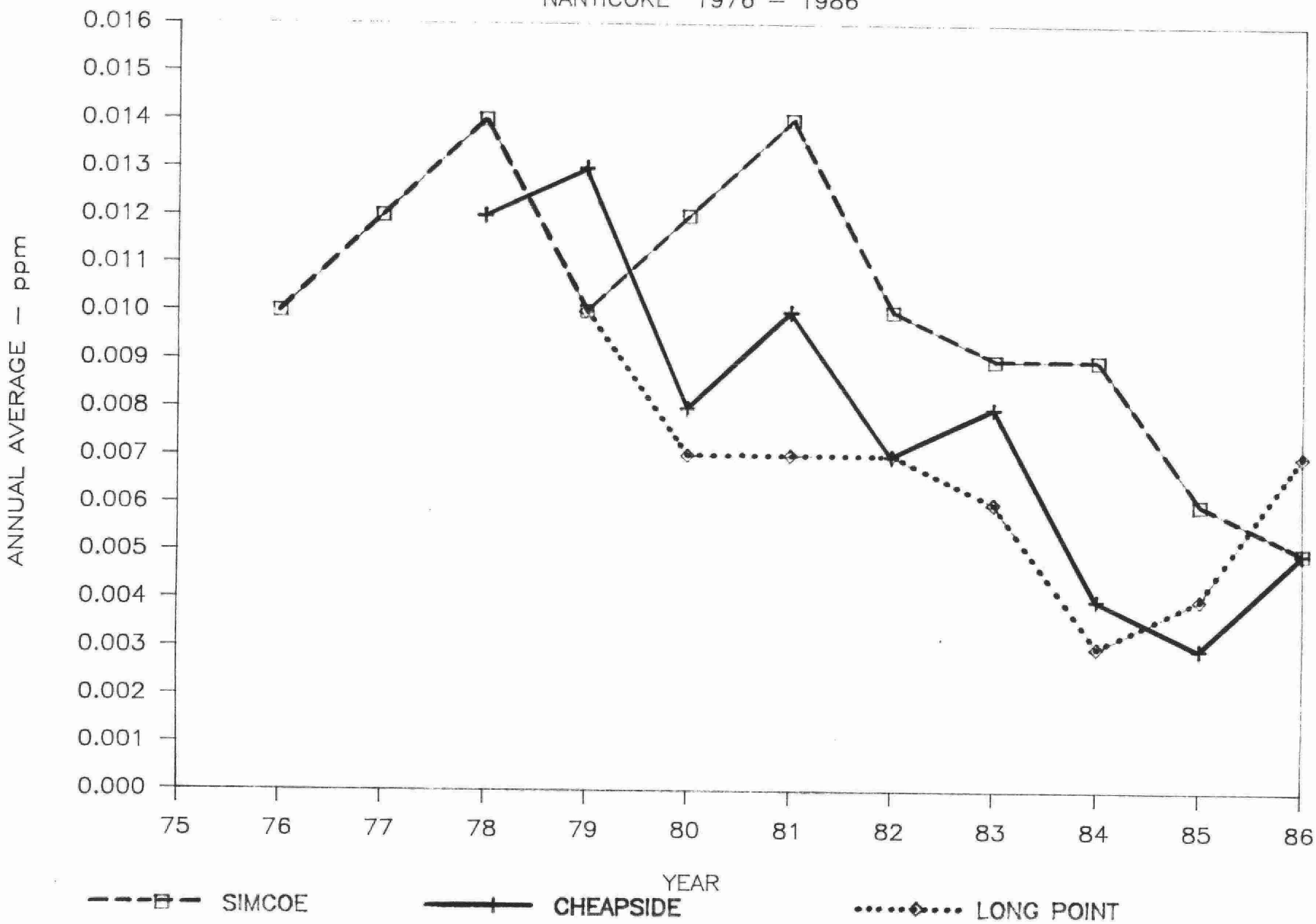
POLLUTION ROSES - 1986

NITROGEN DIOXIDE

FIGURE 9

NITROGEN DIOXIDE YEARLY TREND

NANTICOKE 1976 – 1986



The pollution roses for NO_2 in Figure 8 indicate little contribution from the Nanticoke industries. Road traffic is likely a greater factor than industrial emissions.

Yearly trends of NO_2 for the three stations are given in Figure 9. In the past few years a trend to decreasing concentrations is apparent although minor increases occurred at the Cheapside and Long Point stations in 1986.

Hydrocarbons

Ambient hydrocarbons can come from vehicular traffic, seepages at natural gas wells, natural by-products of vegetation, the commercial processing and transportation of refined petroleum products (Texaco) and coking operations (Stelco).

The hydrocarbon monitor measures a large spectrum of individual compounds with varying adverse impacts. Since the mixture of compounds will vary from place to place, it has not been possible to apply a guideline or objective for this parameter.

The instrument separates the hydrocarbons into two fractions-methane and non-methane. The latter are referred to as "reactive" hydrocarbons (RHC) and data for reactive hydrocarbons for three stations are given in Table 6. Since hydrocarbon data measured at station 22086-Cheapside have always read low and Texaco was already being monitored at the school site-22904, the Cheapside monitor was moved to Nanticoke Village, near Stelco. Valid data commenced in June.

In 1986, concentrations of reactive hydrocarbons remained low and unchanged at the school site-22904. Simcoe was also unchanged while the levels measured in Nanticoke Village were comparable to the school site. The pollution roses in Figure 10 show a minor impact from Texaco at the school site. Stelco's impact on the Nanticoke Village site also appears minor. Significantly higher

TABLE 6
NON-METHANE HYDROCARBONS
UNITS - PARTS PER MILLION

			Annual Average	Maximum 1-hour	Maximum 24-hour
22071	Simcoe	1986	.19	0.6	0.3
		1985	.22	0.8	0.4
		1984	.17	2.8	0.3
22904	South Walpole School	1986	.09	1.5	0.4
		1985	.06	3.0	0.4
		1984	.19	2.0	0.8
22907	Nanticoke Village	1986	.11[7]	0.8	0.3

7 - 7 month average (June - December)

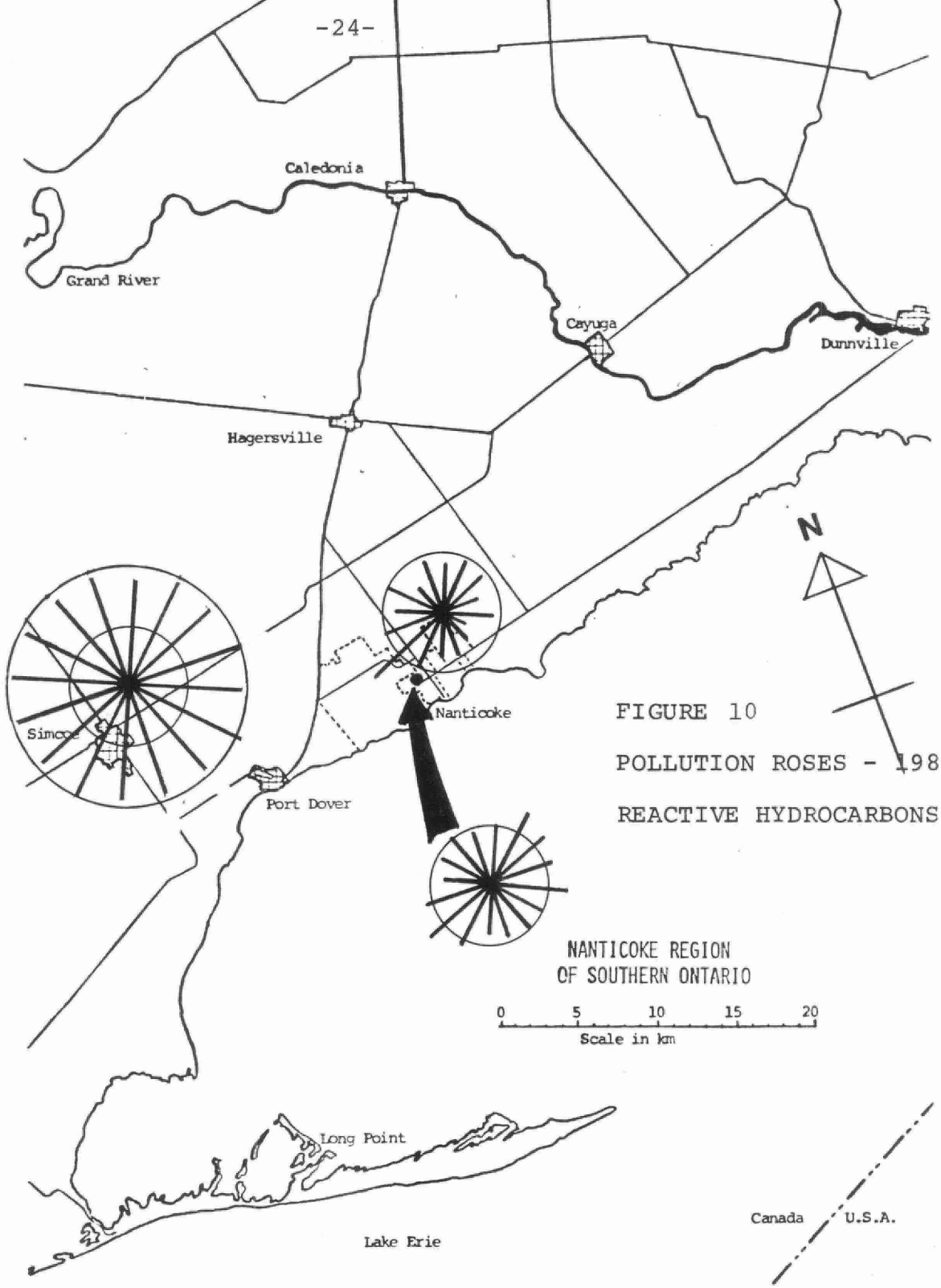


FIGURE 10

POLLUTION ROSES - 1986

REACTIVE HYDROCARBONS

Scale : ppm

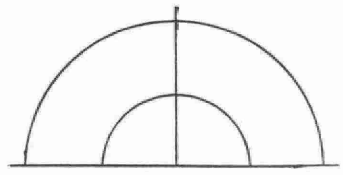


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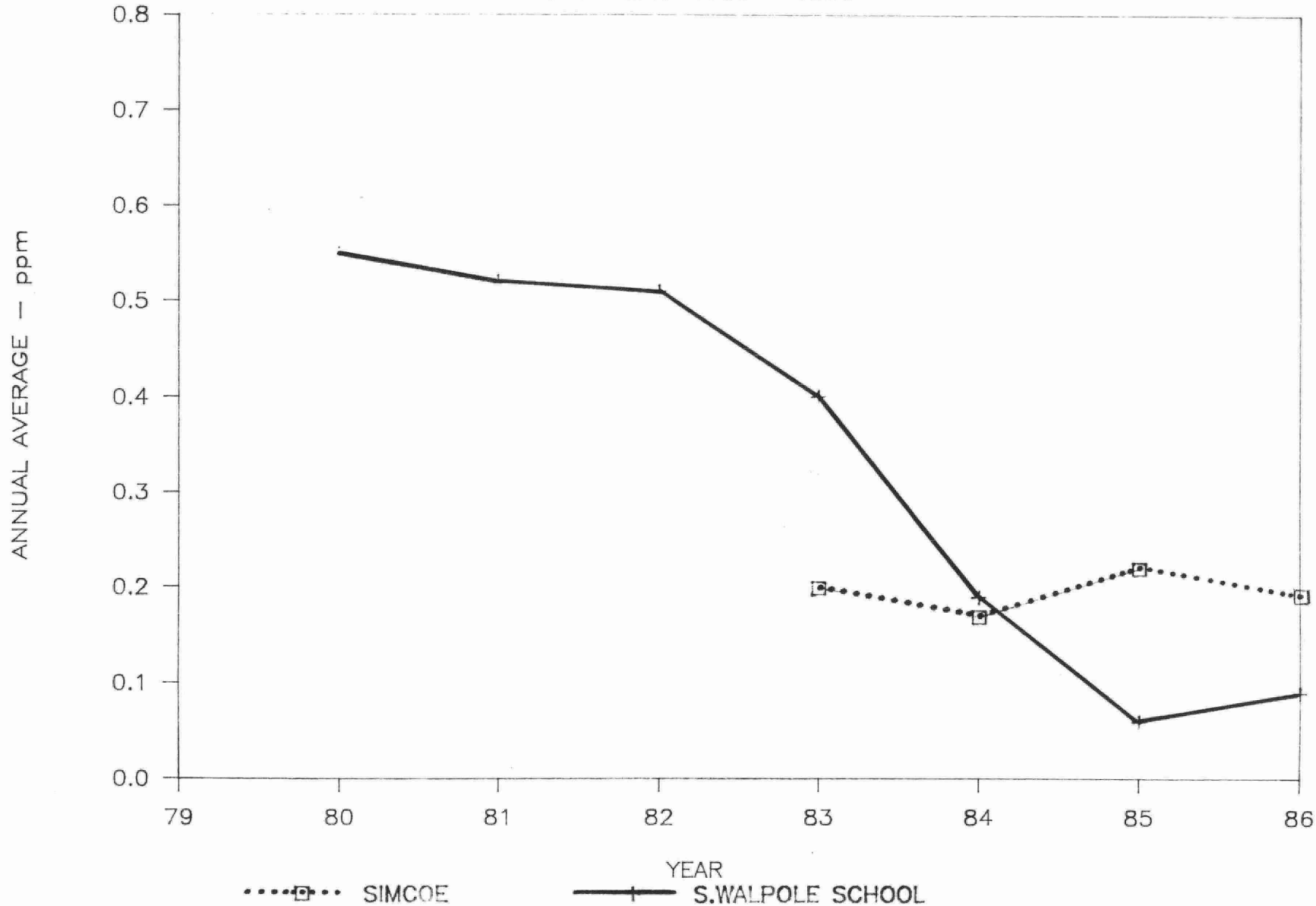
FIGURE 11

REACTIVE HYDROCARBONS YEARLY TRENDS

NANTICOKE 1980 – 1986



levels were measured at Simcoe, but the rose shows uniform concentrations from all directions. The higher levels may either be due to technical problems or less likely, due to some local sources such as vehicle emissions.

Yearly trends for Simcoe and the school site are given in Figure 11. The decreasing trend of reactive hydrocarbons should be overlooked since data prior to 1984 are believed to be in error due to instrumentation problems. RHC levels have probably remained stable.

Ozone

Oxidants are products of photochemical reactions involving oxides of nitrogen, hydrocarbons and sunlight. Ozone (O_3) accounts for most of the oxidants produced and the sources of the precursor pollutants are mainly industrial and automotive. Ozone is injurious to different types of vegetation including tobacco and tomato crops. The 1-hour objective for ozone (.08 ppm) is based on vegetation effects, but ozone can have adverse human health effects at higher levels.

Ozone concentrations follow very definite annual and daily trends. Highest levels occur during the summer (May to September), and the daily maxima usually occur during mid-afternoon. Both patterns are directly related to temperature and the amount and intensity of sunlight.

Ozone concentrations were measured at two sites and data are summarized in Table 7. In 1986, concentrations were similar to previous years. There were 165 exceedences of the hourly objective observed at Long Point and 53 at Simcoe. Elevated levels generally occurred at the same time at both stations during the summer with slightly higher concentrations measured at Long Point and usually during southerly winds indicating that the high concentrations were imported from the United States. Similar to 1985 there were 36 separate days during the summer in which one or

TABLE 7
OZONE
UNITS - PARTS PER MILLION Ontario Objective: 1-hour - .08

		Annual Average	Maximum 1-hour	No. of Hours Above Objective
22071 Simcoe	1986	.028	.105	53
	1985	.031	.118	71
	1984	.029	.115	123
22901 Long Point	1986	.031	.124	165
	1985	.034	.135	183
	1984	.030	.130	144

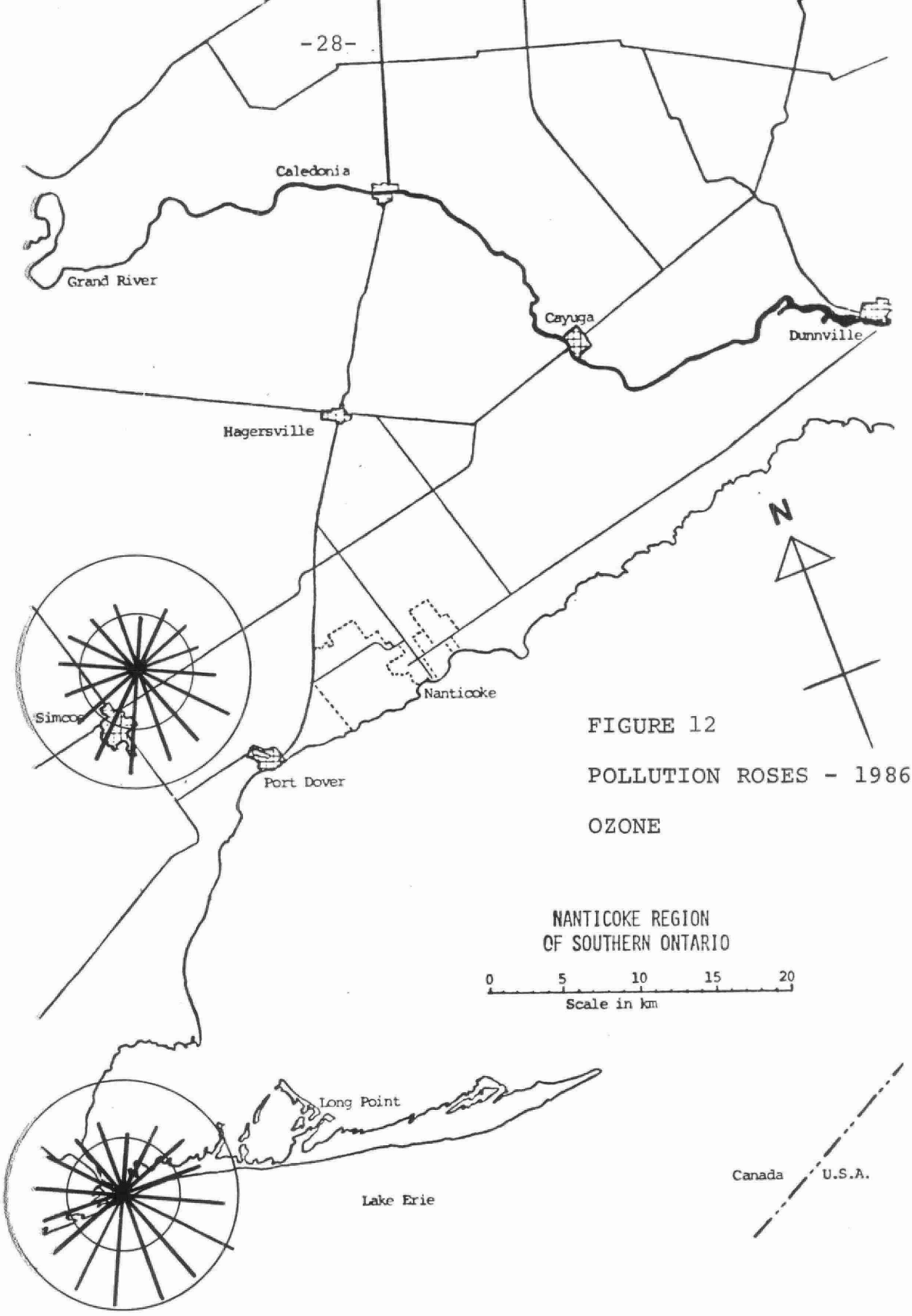


FIGURE 12

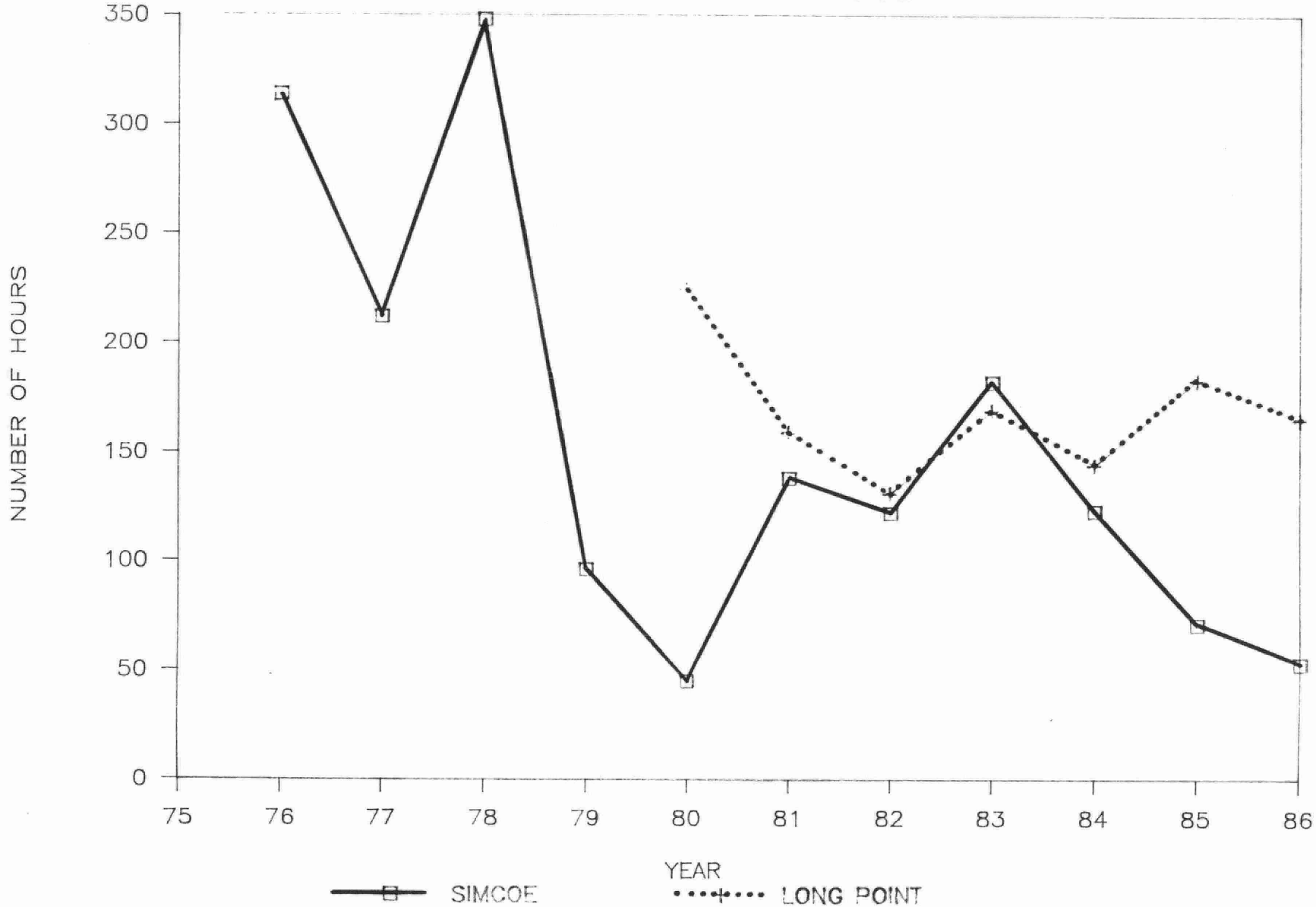
POLLUTION ROSES - 1986

OZONE

FIGURE 13

OZONE EXCEEDENCE TRENDS

HOURS OVER 80 PPB – NANTICOKE



both stations exceeded the hourly objective. Simcoe once again recorded far fewer hourly exceedences than Long Point. In 1985 this was at least partially due to the fact that the Simcoe instrument was out of service for extended periods of time in the critical growing months of August and September. However, in 1986 no such downtime occurred at Simcoe. In fact, Long Point experienced downtime at the end of June, missing some elevated concentrations that Simcoe measured. The increasing disparity between the two stations is largely unaccounted for except that slightly higher levels of nitric oxide have been measured at Simcoe during 1984-86. Nitric oxide is an efficient scavenger of ozone. Since Long Point NO levels have been stable, the change in NO at Simcoe may have lowered ozone levels there.

The pollution roses in Figure 12 confirm that the highest averages occurred under winds from the south and southeast although the relative magnitudes were not that much greater than for other directions. Elevated concentrations do not automatically occur with southerly winds, even during the summer. Specific meteorological conditions are necessary.

The yearly trend graph of hourly exceedences at the two stations in Figure 13 indicates random fluctuations which are probably related to climatological variation. The increasing disparity between Long Point and Simcoe is evident in this graph.

Ozone, hydrocarbons and oxides of nitrogen can be transported over great distances and can be augmented by local sources. It is generally believed that the ozone problem in Southern Ontario is due to long range transport from the United States and thus will have to be resolved on an international rather than local scale.

Total Suspended Particulates

Total suspended particulates (TSP) are measured with high volume samplers which draw a known volume of air through a pre-weighed filter for a 24 hour period (midnight to midnight). The exposed filter is weighed, and the difference (weight of solids on filter) in conjunction with the known air volume sampled is used to

calculate a TSP concentration in micrograms per cubic metre. The objective for a 24 hour average is 120 ug/m^3 while the yearly geometric mean objective is 60 ug/m^3. The samplers operate once every six days.

In 1986, the TSP network was reduced from 14 stations to eight. The six terminated stations were all in outlying areas yielding background-type measurements. Of the eight remaining monitors, six bordered industries and two were backgrounds in Jarvis and Port Dover.

Data from total suspended particulate measurements are summarized in Table 8. At four of the stations, the daily objective of 120 ug/m^3 was not exceeded - 22090-Port Dover, 22904-Walpole School, 22961-Nanticoke North and 22965-Dogs Nest.

The daily objective was exceeded once each at 22087-Jarvis and 22964-Stelco North. The Jarvis exceedence occurred on July 25 during a day of SSW winds. Local sources, possibly a baseball diamond, were likely responsible. The 22964 exceedence was on April 26 on a northeast wind day. Farming activities may have been responsible. All six of these stations easily met the yearly objective of 60 ug/m^3.

Nanticoke Village (22907) recorded three exceedences all on windy southwest wind days. Fugitive emissions from roadways, storage piles, etc. on Stelco property were likely responsible. The three events were an improvement from 1985 when six such exceedences occurred. Increased roadway oiling and other measures taken by Stelco seemed to improve dust blowoff problems. The yearly objective was exceeded only marginally.

Station 22092-Rainham/Sandusk near the Ontario Hydro Generating Station recorded the highest concentrations. A severe deterioration of the yearly geometric mean occurred - almost doubling from 1985 and rose well above the yearly objective.

There were 11 exceedences of the daily objective and six of the events could positively be ascribed to Ontario Hydro emissions.

TABLE 8
SUSPENDED PARTICULATES
UNIT - MICROGRAMS PER CUBIC METRE

Ontario Objectives:-24-hour-120
1-year geometric mean - 60

	Geometric Mean 1984	1985	1986	Maximum 1986	% of Samples Above 120 (1986)
22087 Jarvis	49	49	44	155	2
22090 Port Dover	39	32	30	76	0
22092 Rainham/Sandusk	-	37	71	206	20
22904 South Walpole School	32	30	33	89	0
22907 Nanticoke Village	58	59	62	161	5
22961 Nanticoke North	40	45	42	119	0
22964 Stelco North	38	39	36	124	2
22965 Dogs Nest/Hwy 6	39	33	36	104	0

In the past, fugitive emissions from coal piles and the ash lagoon area were the prime source of dust and three or four of the six events attributed to the Nanticoke Generating Station did occur on mostly windy days. However, two of the six events occurred on calmer days.

The five remaining exceedence events at 22092 were due to unknown origins. Three occurred in February during east wind days. Road construction in this direction may have been responsible. Two other events occurred in August during northeast winds. Farming activities were a possible source.

Remedial measures to reduce windblown dust emissions at Ontario Hydro started in 1985 and continued in 1986. It was expected that these actions would have improved or at least maintained the low particulate levels measured in 1985. Thus, the large increase observed in 1986 is unaccounted for, except that fugitive emissions are highly dependent on weather conditions. The increase may even have been higher had the control program not been undertaken. Further measures are planned for 1987.

A total of three hi-vol stations have been operating continuously since 1979 in the Nanticoke area, and the combined yearly trend of these stations is shown in Figure 14. No deterioration is evident. However, levels within Nanticoke Village, close to Stelco operations and near Ontario Hydro, remain a local concern and trends will be carefully monitored.

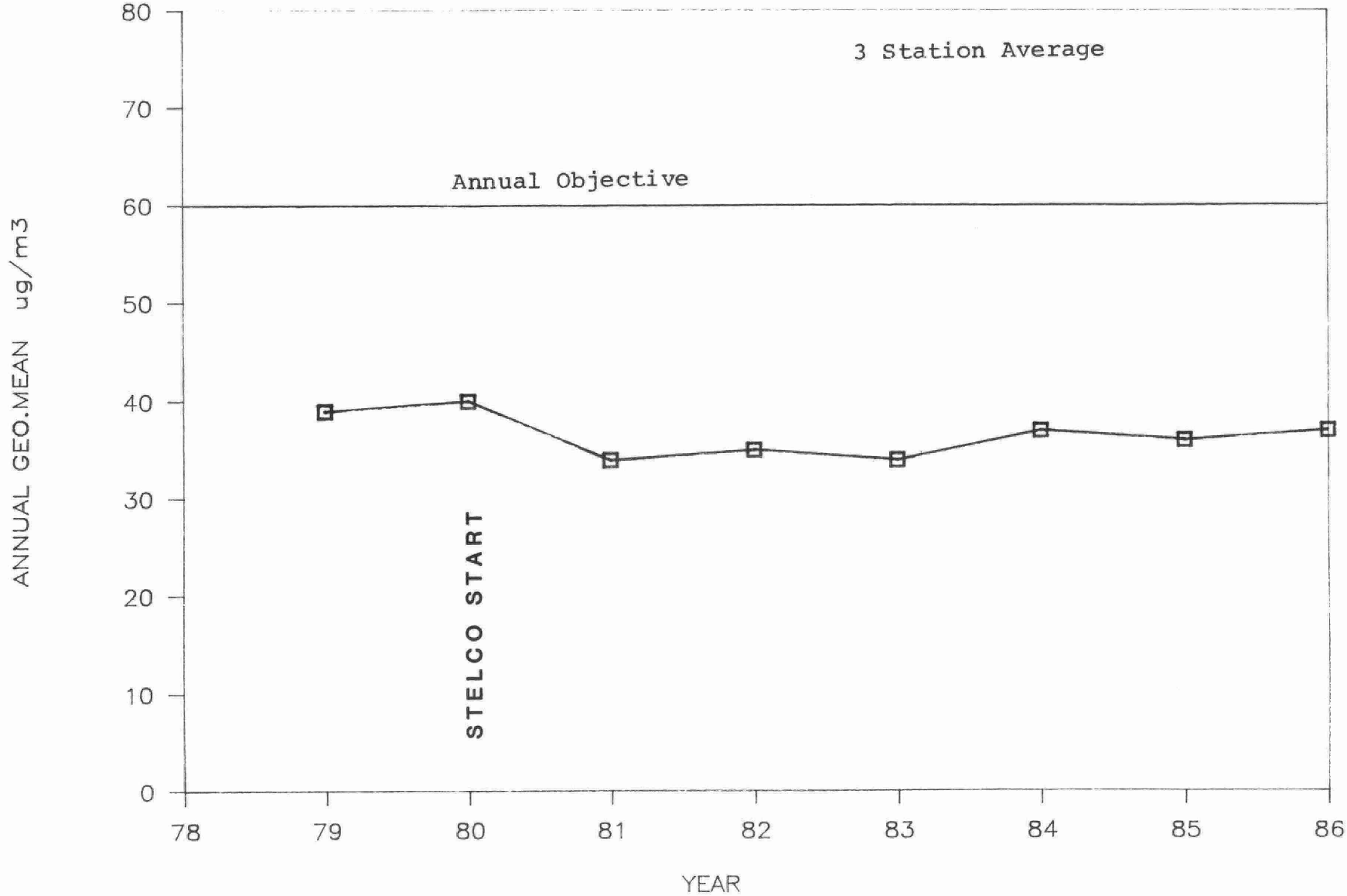
Dustfall

Dustfall is that material which settles out of the atmosphere by gravity. It is collected in plastic containers during a 30 day exposure time. The collected material is weighed and expressed as a deposition rate of grams/m^2/30 days. The measurement is imprecise and effects are restricted to relatively local areas. Dustfall objectives are based on nuisance effects and are 7.0 grams/m^2/30 days (monthly) and 4.5 grams/m^2/30 days (yearly average). Since dustfall is comprised solely of large particles, it is not a health related parameter.

FIGURE 14

SUSPENDED PARTICULATE YEARLY TREND

NANTICOKE 1979 – 1986



Dustfall was measured within Nanticoke Village in 1986, and data are given in Table 9. As in previous years, concentrations were low and below the monthly objective.

The annual trend at this station since 1975 is given in Figure 15. No deterioration is evident until 1984, when there was a definite increase. Concentrations have since held steady, just below the yearly objective.

Two dustfall jars were also located near the Ontario Hydro flyash piles along with the hi-vol previously mentioned. The monthly objective was exceeded once at 22092 and twice at 22093. Both stations recorded their maxima in January. Both readings were extremely high, tending to indicate that Hydro was the source. Microscopic analysis revealed 94% flyash in the 22093 sample but only 13% in the 22092 sample. The 22092 sample contained much carbon, making the exact source of the dust uncertain. The only other exceedence at 22093 occurred in August and was composed mostly of what was identified as carbonate.

A Control Order was issued to Ontario Hydro in 1985 to reduce windblown flyash emissions, which have caused fallout onto neighbouring properties.

Fluoridation

This measurement is a relatively crude assessment used to determine quantities of fluoride compounds in the ambient air. A lime coated paper is exposed to the atmosphere for approximately 30 days and chemically analyzed for fluoride. The fluoride objectives are based on vegetation damage and for this reason, the objective is more stringent during the growing season. For the period April 15 to October 15, it is 40 micrograms/100 cm^2/30 days while for the remainder of the year it is 80. A possible source of this contaminant is Stelco's basic oxygen furnace, although gas scrubbing removes most of the emissions.

TABLE 9
DUSTFALL
UNITS - GRAMS/ SQ. METRE/30 DAYS

Ontario Objectives 1 month-7.0
1 year avg 4.5

	Annual Average			1986 1-Month	No. of Months Above Objective		
	1984	1985	1986	Maximum	1984	1985	1986
22070 Nanticoke Village	4.4^{11}	3.8^{11}	4.3	6.7	1	0	0
22092 Rainham/Sandusk	-	2.7^{9}	4.3	28.4	-	0	1
22093 N.G.S. Flyash Area	-	3.7^{7}	4.8	21.1	-	1	2

Exponents refer to number of months when less than 12 valid samples.

FIGURE 15

DUSTFALL YEARLY TREND

22070 – NANTICOKE VILLAGE

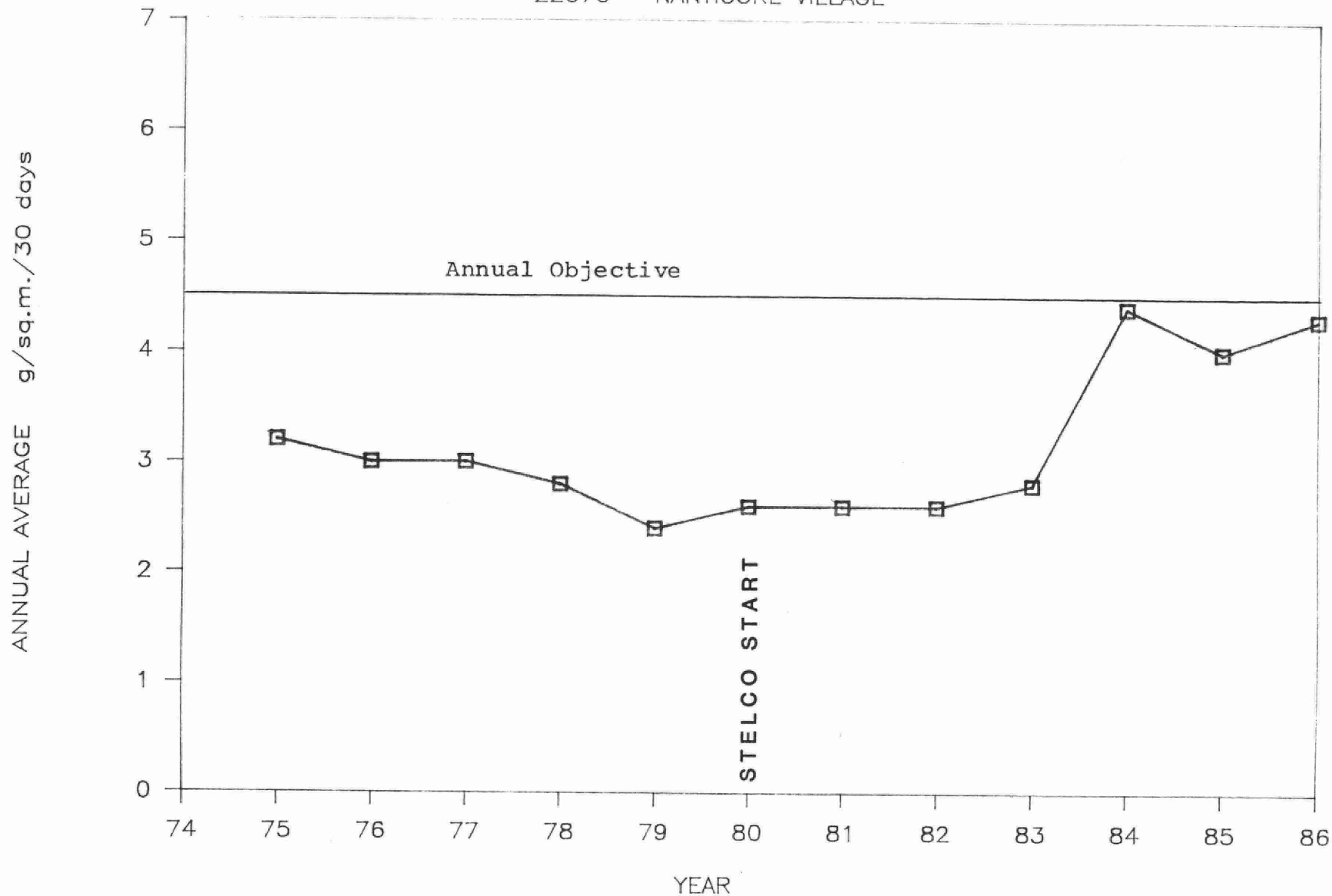


TABLE 10
FLUORIDATION RATE
UNITS - MICROGRAMS F/100 SQ. CM/30 DAYS

Ontario Objectives: Apr.15 to Oct. 15 - 40
Oct.16 to Apr. 14 - 80

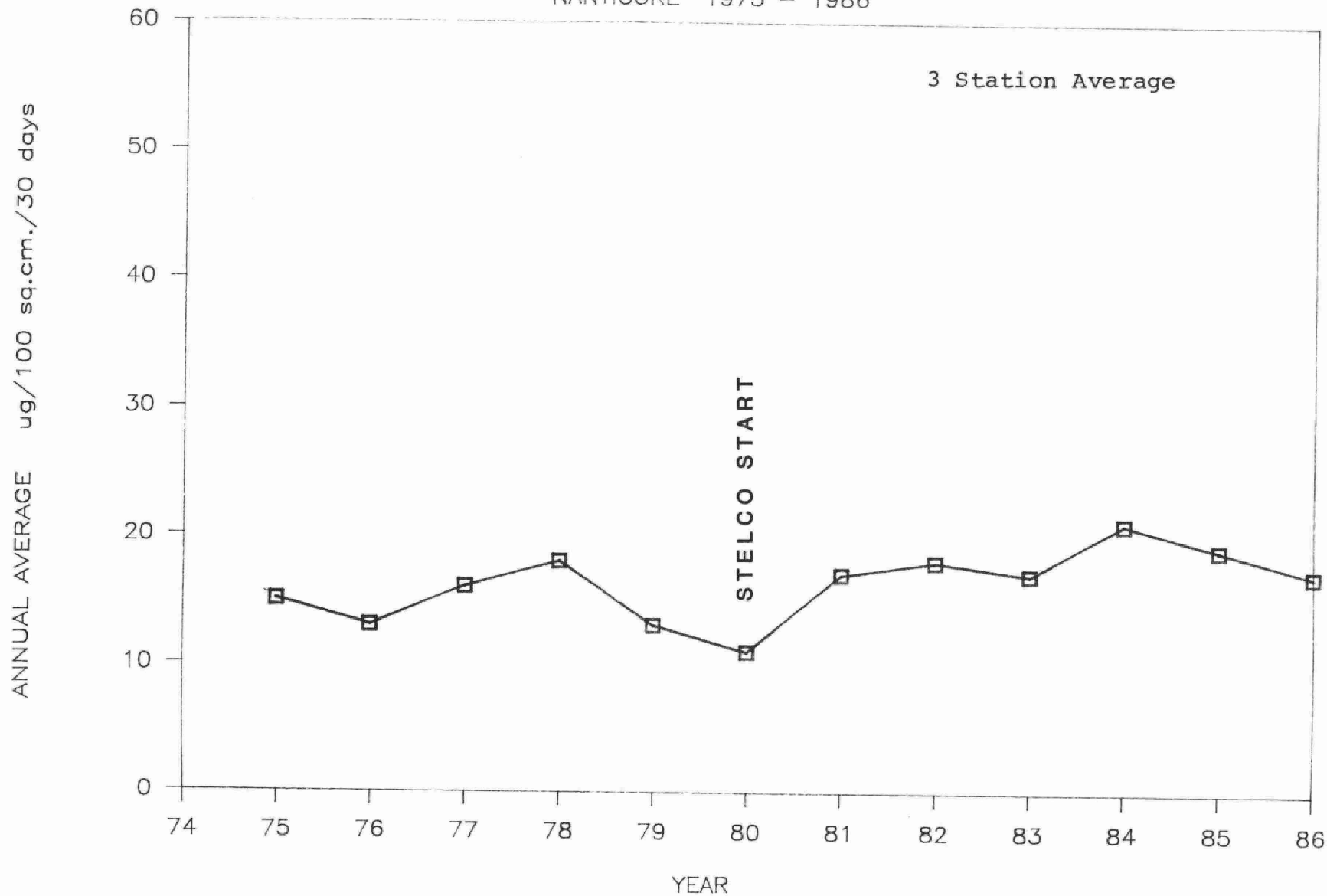
		Annual Average 1984	1985	1986	1986 1-Month Maximum	Number of Months Above Objective 1984	1985	1986
22057	Nanticoke Creek	23	24	21	49	0	0	0
22074	Texaco	23	18	18	34	0	0	0
22083	Dogs Nest	17	15	13	20	0	0	0
22961	Nanticoke North	-	-	32[9]	56	-	-	1

9 - 9 months of sampling (April - December)

FIGURE 16

FLUORIDATION RATE YEARLY TREND

NANTICOKE 1975 – 1986



The fluoride network was reduced from nine to four monitors in 1986. The discontinued stations were all in outlying areas and had recorded very low levels over the years. The remaining four stations surrounded Stelco property and 1986 data are given in Table 10.

Concentrations remained low similar to previous years except for one station which did record one marginal exceedence of the stricter growing season objective. This station was actually a new site, more downwind of the prevailing southwesterlies (from Stelco).

The combined annual trend of the other three stations dating back to 1975 is shown in Figure 16 and indicates little change in levels.

SUMMARY

Overall, 1986 data in the Nanticoke area revealed that air quality is very good and reflected a relatively minor impact by the main industries. Nuisance type problems related to odours near Stelco and dust fallout near Ontario Hydro are the main items of concern.

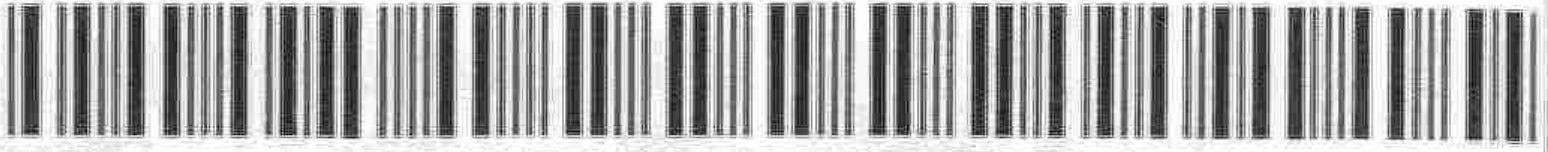
Pollutants such as oxides of nitrogen, hydrocarbons and fluoridation rates showed quite low levels well within relevant objectives. Hydrocarbons were newly monitored in Nanticoke Village but showed little industrial influence by Stelco.

Total reduced sulphur (TRS) levels and related odour problems within Nanticoke Village continued to be a problem in 1986. Discussions with Stelco have been undertaken and the company is planning some preliminary measures to lessen emissions.

Sulphur dioxide (SO_2) normally recorded zero or near zero measurements throughout a large network of monitors. The Nanticoke Generating Station is the largest SO_2 source in the area but its effect on the Nanticoke area was fairly minor. Only 5 hours out of over 100,000 hours of monitoring exceeded the hourly objective.

Particulate levels in the Region were also quite low and generally showed acceptable concentrations. However, as with TRS, Nanticoke Village particulate levels remain a concern. An improvement from 1985 was observed, but fugitive dust emissions from the Stelco mill site were still occasionally a problem, particularly under high wind conditions. The same holds true for Ontario Hydro property. A Control Order was issued to Ontario Hydro to reduce windblown emissions of flyash from the ash lagoon area in 1985. However, a severe deterioration in suspended particulates was measured downwind of Hydro in 1986.

Another pollutant of concern is ozone, a product of long range transport. Elevated concentrations above objectives continued to be observed in 1986 and appeared to arrive mostly from the United States during the summer. Oxidant control will be required on a international rather than local scale.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